Multi-Step Equations Worksheet

Two-step equations and variables on both sides · show every step

Name _____ **Date** _____ **Score** _____ / 28

THE ORDER THAT WORKS

1. Expand any brackets. • **2.** Clear fractions by multiplying every term by the common denominator.

3. Collect like terms on each side. • **4.** Get the variable terms on one side, the numbers on the other.

5. Divide by the coefficient. • **6.** Substitute your answer back into the *original* equation to check.

Whatever you do to one side, do to the other — that is the only rule underneath all six steps.

SECTION A Two-step equations

Undo addition or subtraction first, then the multiplication or division.

1. $3x + 7 = 22$

Answer _____

2. $5x - 8 = 17$

Answer _____

3. $\frac{x}{4} + 6 = 10$

Answer _____

4. $-2x + 9 = 1$

Answer _____

5. $7x + 4 = -17$

Answer _____

6. $\frac{x}{3} - 5 = -2$

Answer _____

SECTION B Variables on both sides

Collect the variable terms on one side and the numbers on the other, then divide.

7. $6x + 5 = 2x + 21$

Answer _____

8. $9x - 3 = 5x + 13$

Answer _____

9. $4x + 11 = 7x - 1$

Answer _____

10. $10 - 2x = 3x - 15$

Answer _____

11. $8x - 7 = 3x + 18$

Answer _____

12. $2x + 14 = 9 - 3x$

Answer _____

Multi-Step Equations Worksheet

Brackets and fractions · expand or clear first

SECTION C Use the distributive property first

Expand the brackets before collecting terms. Multiply *every* term inside.

13 $3(x + 4) = 21$

Answer

14 $5(2x - 1) = 35$

Answer

15 $4(x - 3) = 2(x + 1)$

Answer

16 $-2(x + 5) = 3x - 20$

Answer

17 $6(x - 2) + 4 = 2(x + 6)$

Answer

18 $3(2x + 1) - 4x = 11$

Answer

SECTION D Fractional and awkward coefficients

Clear the fractions by multiplying every term by the common denominator, then solve as usual. Leave answers as exact fractions.

19 $\frac{x}{2} + \frac{x}{3} = 10$

Answer

20 $\frac{2x - 1}{5} = 3$

Answer

21 $\frac{3x}{4} - 2 = \frac{x}{2}$

Answer

22 $4x + 3 = 6x - 2$

Answer

Multi-Step Equations Worksheet

Word problems · define the variable before you write the equation

SECTION E Write your own equation

Define the variable, write the equation, solve it, then answer in a sentence.

23 The sum of three consecutive integers is 72. Find the integers.

Answer _____

24 A phone plan costs $15 per month plus $0.10 per minute. A bill came to $32. How many minutes were used?

Answer _____

25 A rectangle is 5 cm longer than it is wide, and its perimeter is 38 cm. Find its dimensions.

Answer _____

26 Two taxi firms charge differently. Firm A charges $4 plus $2 a mile; firm B charges $10 plus $1.25 a mile. At what distance do they cost the same?

Answer _____

Multi-Step Equations Worksheet

Reasoning · answer in your own words

SECTION F Explain your reasoning

A sentence or two each.

27 A student solves $3(x + 2) = 18$ by writing $3x + 2 = 18$. Explain the error and give the correct solution.

Answer _____

28 How can you check a solution without re-solving the equation? Demonstrate with $x = 5$ in $4x - 3 = 17$.

Answer _____

THE MISTAKE TO AVOID

Distributing to only the first term inside the brackets. $3(x + 2)$ is $3x + 6$, never $3x + 2$. The same applies with a negative outside: $-2(x - 5)$ is $-2x + 10$, because the minus multiplies both terms.

Answer Key

Every solution substituted back into its original equation at build time.

SECTION A

1. $x = 5$ -7, then $\div 3$

2. $x = 5$ $+8$, then $\div 5$

3. $x = 16$ -6, then $\times 4$

4. $x = 4$ -9, then $\div -2$

5. $x = -3$ -4, then $\div 7$

6. $x = 9$ $+5$, then $\times 3$

SECTION B

7. $x = 4$ $4x = 16$

8. $x = 4$ $4x = 16$

9. $x = 4$ $12 = 3x$

10. $x = 5$ $25 = 5x$

11. $x = 5$ $5x = 25$

12. $x = -1$ $5x = -5$

Answer Key

Every solution substituted back into its original equation at build time.

SECTION C

13. $x = 3$ $3x + 12 = 21$

14. $x = 4$ $10x - 5 = 35$

15. $x = 7$ $4x - 12 = 2x + 2$

16. $x = 2$ $-2x - 10 = 3x - 20$

17. $x = 5$ $6x - 8 = 2x + 12$

18. $x = 4$ $2x + 3 = 11$

SECTION D

19. $x = 12$ $\times 6$: $3x + 2x = 60$

20. $x = 8$ $\times 5$: $2x - 1 = 15$

21. $x = 8$ $\times 4$: $3x - 8 = 2x$

22. $x = \frac{5}{2}$ $5 = 2x$, so $x = \frac{5}{2}$

Answer Key

Every solution substituted back into its original equation at build time.

SECTION E

23. Let the smallest be x: $x + (x + 1) + (x + 2) = 72$, so $3x + 3 = 72$ and $x = 23$. The integers are **23, 24 and 25**.

24. $15 + 0.10m = 32$, so $0.10m = 17$ and $m = 170$. **170 minutes**.

25. Let the width be w: $2w + 2(w + 5) = 38$, so $4w + 10 = 38$ and $w = 7$. **7 cm by 12 cm**.

26. $4 + 2m = 10 + 1.25m$, so $0.75m = 6$ and $m = 8$. They cost the same at **8 miles**.

SECTION F

27. They multiplied only the first term inside the brackets. The 3 must multiply *every* term: $3x + 6 = 18$, so $3x = 12$ and $x = 4$. Their version gives $x = \frac{16}{3}$, which does not satisfy the original equation.

28. Substitute it into the original equation and check both sides match. $4(5) - 3 = 20 - 3 = 17$, and the right side is 17, so $x = 5$ is correct. Substituting catches arithmetic slips that re-solving the same way would repeat.